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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,448	09/26/2006	Qingquan Su	035924-0133	3574

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EXAMINER	
BHAT, NINA NMN	

ART UNIT	PAPER NUMBER
1797	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,448	SU, QINGQUAN	
	Examiner	Art Unit	
	N. Bhat	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12-27-2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's preliminary amendment and newly submitted claims of December 27,2005 has been noted by the examiner. The examiner acknowledges that claims 1-17 have been cancelled and claims 18-37 are pending.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 18-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hagan et al. US PGPUB 2003/0118489.

Hagan et al. teach the invention substantially as claimed. Hagan et al. teach an integrated fuel processing system which includes a housing and disposed within the housing are two or more individual operating units the operations include chemical reaction, combustion of fuel which includes a burner, partial oxidation, desulfurization etc. [Note Paragraph 0013]. Hagan teach that the fuel processor (10) converts hydrocarbon fuel into a hydrogen enriched gas or reformate stream. The fuel process includes two modules (12a and 12b) each of which is self-contained and configured to conduct unit operations and/or reaction. Hagan teaches that

the modules would include a burner, a reformer selected from partial oxidation reactor, a steam reformer or combination autothermal reformer), a shift reactor including both high temperature and low temperature shift reactor and a preferential oxidation (selective oxidation) reactor are unit operations or modules which are particularly used in the fuel processing system. All of the units or modules need not be present or identically arranged which would lend one to ordinary skill that omitting or adding various modules within a housing all integrally connected has been contemplated by Hagan et al. Hagan teach that module 12a can include partial oxidation reaction in section (20) thermally coupled with a steam reforming reaction of hydrocarbon feed which provides an autothermal reforming section (22) which generates reformat or an hydrogen enriched stream. Both high temperature water gas shit and lower temperature water gas shift reactions can be carried our two succeeding sections (16 and 18) of module 12(b). The modules 12 and 12b are aligned in parallel and together the housing (14) is sized and shaped to provide a bounding to bound the side-by-side cylindrical modules (12a and 12b). [See Paragraph [0035]]. In Figure 5, Hagan et al. teach a fuel processor (11) having three main cylindrical modules (34, 36 and 38) each modules is conducts distinct unit operations. The modules are arranged and disposed within a housing. The unit operations contemplated by Hagan et al. include an ATR (autothermal reformer) in module 38, HTS and LTS (high and low temperature shift reactor) in modules 36 and preferential oxidation (PROX) module in one or more stages or thermal gradients in module 34. The modules are constructed such that the modules are in proper alignment by end closures (46 and 48) and include interstitial space and fluid connections which include fluid communication between modules as well as heat exchange connections between the modules and further include burners and the heat exchange means are integrated heat exchange and communicates with the modules such that fluids flow through

the modules taking advantage of the endothermic and exothermic reactions taking place during reforming of a fuel [Note Paragraphs [0045 to 0064]

However, Hagan et al. do not specifically teach the catalyst arrangement or the baffle plate provided in the gap joint between the high temperature unit and low temperature, or the expandable member as claimed by applicant.

Hagan et al. teach in paragraph [0062], that all modules can contain one or more of catalyst, catalytic reaction zones, adsorbents, heat exchangers, mixers or other units. Further housing an manifold bearing end closures disposed within the housing and manifolds can be built both in the housing as well as in the modules so that manipulation of flow and total control of flows into and out of the modules and housing of the streams are maximized and efficiency of the modules including all appropriate plumbing has been contemplated and recognized by applicant. Hagan teach in Paragraph [0047] that added support, spaces or shims which could arguably read on applicant baffles, for the modules could be provided by spacers placed between the modules or on the inner surface of the housing. Hagan et al. teach that the catalyst and/or adsorbent can be granular. With respect to the applicant's catalyst arrangement, baffle plate and expandable members this is considered to be obvious from the teachings of Hagan. Hagan teaches that including spacers, and mixers and adsorbents, heat exchangers within the modules, specific fluid piping and plumbing connections are all within the realm of the ordinary artisan familiar with modular reformer/fuel processing design. Hagan et al. teach applicant's integrated fuel reformer which includes high temperature unit including a combustion chamber, a low temperature unit having a shift converter section connected to the high temperature shift converter section, Prox (selective oxidation) section and flow connections and a vessel for integrally housing the high temperature unit and medium low temperature which has been taught and described by the modules shown in Figure 5. The catalyst arrangement, baffle,

spaces, mixers, adsorbents as stated above are considered to be obvious design choice parameters which have been taught and recognized by the ordinary artisan and specifically by Hagan et al. It therefore the position taken by the examiner that Hagan teaches applicant's invention substantially as claimed providing a fuel reformer which is simple in structure and manufacture, i.e. its modular construction permits both easy replacing and mechanical construction, and is capable of reforming a fuel gas which includes a high temperature unit having a combustion chamber, a reforming sections which includes reforming catalyst, which is operative connection with both high temperature and low temperature shift units, as well as a Prox or selective oxidation units and heat exchange units all of these elements and modules are in operative communication with each other to efficiently produce a hydrogen containing stream which can be eventually used in a fuel cell for generating power and/or electricity thereby rendering applicant's invention as a whole obvious to one having ordinary skill in the art at the time the invention was made.

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Goebel et al. ‘062 teach an integrated fuel processor configured for rapid start-up. The fuel processor of Goebel et al. includes a reformer, a shift reactor and preferential oxidation reactor and vaporizer for heating the Prox reactor to operating temperatures. Mirura et al. teach a single pipe cylinder type reformer for manufacture of hydrogen rich reformatted gas by steam reforming of a hydrocarbon based fuel. Schussler et al. teach a method for operating a system for water-vapor reforming of a hydrocarbon. Verrill et al. teach a compact module fuel converter for producing hydrogen from hydrocarbon fuels or from methanol or ethanol by steam reforming and desulfurization. Nakamura et al. teach a reforming apparatus which produced reformed gas from a fuel and steam. Clawson et al. teach a reforming apparatus which generates hydrogen wherein heat transfer is optimized in the multi-shelled reformer. Bentley et al. teach an

integrated reforming apparatus which includes a reformer as well as shift reactor for the production of a hydrogen enriched stream by reforming a hydrocarbon containing fuel.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Bhat whose telephone number is 571-272-1397. The examiner can normally be reached on Monday-Friday, 9:30AM-6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. Bhat/
Primary Examiner, Art Unit 1797